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**Subject:** “Upland” versus “In-water” Definition and Portland Harbor Elevation Datums  
Portland Harbor Superfund Project

The Portland Harbor project is divided into two regions, uplands and in-water, to share specific management responsibilities between Oregon Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA). EPA’s Administrative Order on Consent for Remedial Investigation/Feasibility Study (AOC, dated September 2001) states the “upland and in-water” terms are administratively convenient, but do not represent demarkation of either agency’s authority. DEQ’s agreements with upland responsible parties (RPs) (e.g., Oregon Steel Mills Agreement, June 2000) define the upland by “the portion of the facility above the mean high water mark.” However the “mean high water mark” can be relative and hard to accurately define. In an effort to avoid setting ambiguous boundaries that could create an uninvestigated gap along the river bank, DEQ proposes to define “mean high water mark.”

Defining the “upland” versus “in-water” distinction relies on river stage data. This data set is relative to a river datum, the Columbia River Datum (CRD), which differs from typical land survey datums. The following summary is intended to clarify some of the issues that arise between a river stage and the different land elevation(s) used in the Portland Harbor project area, provide some basic conversions, and present DEQ’s initial working definition of “mean high water mark”.

### **PORTLAND AREA AND RIVER DATUMS**

The four (4) common datums in the Portland area include:

- Columbia River Datum (CRD)
- National Geodetic Vertical Datum (NGVD)
- City of Portland Datum (COP or CPD)
- North American Vertical Datum 88 (NAVD88)

Columbia River Datum. General river-based activities use this datum. The zero point of this datum is a sloping line stretching from Willamette Falls to the mouth of the Columbia River. This is a plane from which heights or depths are measured on the Columbia and Willamette Rivers. Because this datum is a sloping line, the zero reading at each river mile corresponds to a different land elevation. Attachment 1 presents an approximate conversion of the CRD at each river mile to NGVD.

National Geodetic Vertical Datum. A standard used throughout the United States. The vertical datum was surveyed in 1929 and resurveyed in 1947 verifying the initial results. The conversion of the CRD (sloping line) to the NGVD (1929 or 1947) for each river mile is provided on the table in Attachment 1.

City of Portland Datum. This elevation survey datum is a historic local datum that is still used in the Portland area. The zero elevation CPD is equivalent to 1.37 NGVD.

North American Vertical Datum 88. This is the modern resurvey of various benchmarks using technology in 1988. The conversion of this datum to the other datums requires benchmark-specific corrections.

## **RIVER STAGE GAUGES**

There are two USGS river stage gauges in the Portland area reporting river stage using CRD.

- USGS Gauge # 14211720 (Morrison Street Bridge in downtown Portland). Correction from river gauge value to NGVD is to add +1.55 feet to the river stage value.
- USGS Gauge # 14144700 (Vancouver, Washington at the Interstate 5 Bridge). Correction from river gauge value to NGVD is to add +1.82 feet to the river stage value.

Real-time and limited historic data are available on the USGS web site (<http://waterdata.usgs.gov/or/nwis/uv?14211720>), and the full data set is available from the USGS Portland office. A graphical presentation of these two gauges to several datums is presented in Attachment 2.

## **VERTICAL RIVER REFERENCE POINTS**

The following bullets describe vertical reference points that may be referred to, or used in, the Portland Harbor investigations and their relationships to other datums.

- Willamette River Flood Stage – Portland: 18 feet CRD
- Ordinary High Water Line (OWHL): Oregon Division of State Lands (DSL) defines this as a line on the bank or shore to which the high water ordinarily rises annually in season (ORS 274.005). The OHWL excludes exceptionally high water levels caused by large flood events (e.g., 100 year events). OHWL is indicated in the field by the following physical characteristics:
  - (a) Clear, natural line impressed on the shore;
  - (b) Change in vegetation (riparian (e.g., willows) to upland (e.g., oak, fir) dominated);
  - (c) Textural change of depositional sediment or changes in the character of the soil (e.g., from sand, sand and cobble, cobble and gravel to upland soils);
  - (d) Elevation below which no fine debris (needles, leaves, cones, seeds) occurs;
  - (e) Presence of litter and debris, water-stained leaves, water lines on tree trunks; and/or,
  - (f) Other appropriate means that consider the characteristics of the surrounding areas.

USACE presents ordinary high water line values (1973) per river mile using the CRD in the attached table (Attachment 1).

- Mean High Water This is a tidal datum. It is the arithmetic mean of the lower of the two daily high tide heights. Tides generally affect the Willamette river levels at river stages less than 12 feet (CRD), and are pronounced at stages less than 5 to 6 feet (CRD), generally occurring during summer and fall seasons.
- Mean High River Stage A mean high river stage can be calculated from the river stage data collected during the wet season at the Portland USGS river gauge (USGS Gauge # 14211720). The river stage data are relative to the CRD. The table in Attachment 2 summarizes the monthly mean high water data for the last 16 years from the Portland USGS gauge. This table includes the flood data from 1996 and 1997. Alternatively, all flood stage data points can be eliminated prior to calculating a monthly mean high water (bottom of table in Attachment 3).

### **DEQ's APPROACH**

DEQ's boilerplate Portland Harbor agreement states the upland investigation “shall exclude that portion of the facility that is below the mean high-water mark of the Willamette River.” For Portland Harbor upland projects, DEQ has chosen to provide an initial definition of an upland harbor site boundary using one elevation for consistency, and to minimize gaps in river bank evaluation(s). DEQ's initial definition is 8 feet CRD (9.55 feet NGVD) as measured on the USGS Morrison Bridge river gauge. This value is the monthly mean high river stage during the wet season minus the flood stage data (bottom of Table in Attachment 3).

This starting point elevation definition will be combined with site-specific discretionary modifications. For example, a discretionary modification might include sampling below this starting point elevation to evaluate potential risks to upland ecological receptors (e.g., small vertebrates) from contaminant exposure during their activities in the normally exposed riverbank areas, or possibly sampling required for upland source control actions.